DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Base from U.S. Geological Survey,
Port Alexander, Sitka, 1951;
Petersburg, 1960; Sumdum, 1961

Universal Transverse Mercator projection

Geology modified from Brew and others, 1984, and Latham and others, 1965

SCALE 1:250 000

5 0 5 10 15 20 MILES

5 0 5 10 15 20 25 30 KILOMETERS

NATIONAL GEODETIC VERTICAL DATUM OF 1929

AREA OF MAP

AREA OF MAP

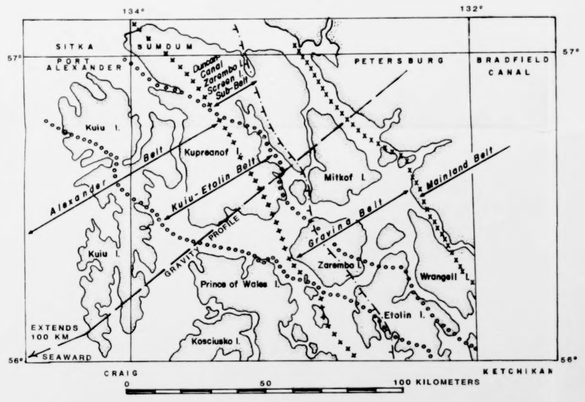


Figure 1. Index map from Brew and others (1984) showing geology belts, 1:250,000-scale quadrangles, and location of gravity profile. Symbols indicate belt boundaries.

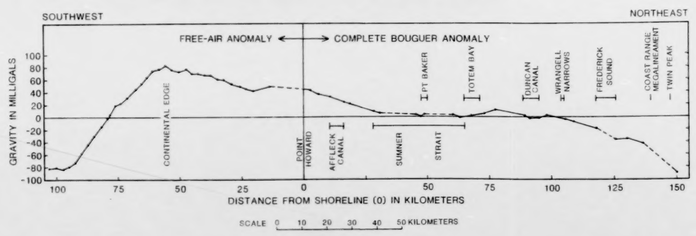


Figure 2. Profile of complete Bouguer gravity anomalies across Petersburg and part of southern Port Alexander quadrangles. Profile has been reduced by a factor of four (to scale 1:1,000,000) and has been extended southwestward across continental margin using free-air anomaly data from Bruns and others (1981); dashed where uncertain.

CORRELATION OF MAP UNITS

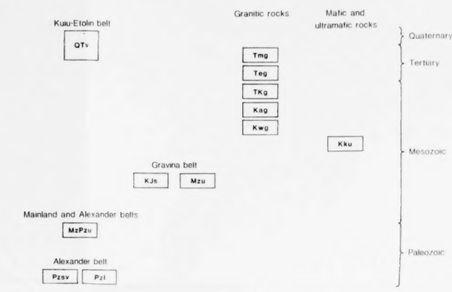


Table 1.—*Description of geologic map units and measured density data*

[Metamorphic equivalents of KJs, Mzu, MzPzu, Pzsv, and Pzl are included within these units. Generalized rock unit symbols modified from Brew and others (1984). Density data in g/cm³]

Generalized rock unit symbol	Age, rock types, and [belt]	Included units from detailed geologic map (Brew and others, 1984)	Number of density samples	Minimum density	Maximum density	Average density	Standard deviation
	Sedimentary and volcanic rocks						
QTv	Late Tertiary and Quaternary sedimentary and volcanic rocks (Quaternary surficial deposits not included) [Kuiu-Etolin belt]	Qs, Qb, QTv, QTc, QTr, QTf, QTa, QTb, QTx, Tmd, Tmgb	28	2.28	2.95	2.70	0.11
KJs	Late Jurassic to Early and (or) mid-Cretaceous [Gravina belt] flysch and volcanic rocks and metamorphic equivalents	Tsh, Ksg, Kss, Ksp, KJsv, KJss, Ksm	62	2.69	3.20	2.76	.12
Mzu	Late Mesozoic undivided greenstone, chert, phyllite, melange (including exotic blocks) [Gravina belt]	Mzm, Mzs, Mzl, Mzv, Mzc, Mz, Mzp, Trhp, Trhv, Trhs, Tp, Dls	18	2.56	3.06	2.80	.18
MzPzu	Permian to Late Triassic sedimentary and volcanic rocks, and limestone [upper Alexander belt], and metamorphic equivalents [Mainland belt]	TKp, TKbs, TKhs, TKmb, TKbg, TKhg, Trhh, Trhl, Trhc, Trhb, Trk, Pp, Phl, Phb	40	2.53	2.93	2.73	.09
Pzsv	Ordovician to Mississippian sedimentary and volcanic rocks and related conglomerate [lower Alexander belt] and metamorphic equivalents	Cl, CDs, MDc, MDcv, Dl, DSva, DSvg, DSvb, Stbg, Stbc, Stbl, Stbv, Stpg, Stpc, SOrdg, SOrdl, Dsh, Kbln, Kdh, Koh, Kpch	94	2.63	2.94	2.72	.06
Pzl	Silurian limestone and related conglomerate and metamorphic equivalents [lower Alexander belt]	Khh, Koh, Sck, Sckc, Sch, Schc Scp, Stbo, Kch	15	2.68	2.96	2.77	.09
	Intrusive rocks						
Tmg	Late Tertiary granitic and related rocks [Kuiu-Etolin and Mainland belts] (about 20 Ma)	Tmaw, Tmge, Tmme, Tmaz, Tmgk, Tmdk, Tdr, Tag	9	2.49	2.83	2.63	.12
Teg	Mid-Tertiary granitic rocks and associated migmatite [Mainland belt] (about 58 Ma)	Tmgz, Tmgy, Tgdb, Tgdp, Tgrg	16	2.65	2.73	2.69	.03
TKg	Latest Cretaceous to Earliest Tertiary granitic rocks [Mainland belt] (about 63 Ma)	Tmgx, Ttos, Tgdg	14	2.68	2.82	2.79	.04
Kag	Late Cretaceous granitic rocks [Gravina and Mainland belts] (about 90 Ma)	Kmgf, Klef, Klif, Klop, Ktoc, Kqop, Ktqp, Kgo, Kdi	23	2.52	2.87	2.72	.08
Kwg	Mid-Cretaceous granitic rocks [lower Alexander and Gravina belts] (about 100 Ma)	Kwgd, Kwgo, Kwan	13	2.60	2.85	2.71	.09
Kku	Mid-Cretaceous ultramafic and mafic rocks [lower Alexander and Gravina belts] (100-110 Ma	Kbdu, Kbwh, Kbgb, Kbgd, Kuk, Khb, Mzgb, Mzq, Mzum	8	2.51	3.28	2.90	.24

EXPLANATION

Gravity contours—Showing complete Bouguer anomaly in milligals. Dashed where data are incomplete. Hachures indicate areas of low gravity. Contour interval 5 milligals

A — Anomaly—Letter refers to discussion in text

-18.1 / 2.66 — Measurement location—Number above symbol indicates complete Bouguer gravity in milligals. Number below symbol indicates specific gravity of sample collected

Geologic contact—Dotted where concealed

Fault—Dotted where concealed

Lineament

Limit of geologic mapping

INTRODUCTION

This complete Bouguer gravity map of Petersburg and parts of Port Alexander, Sitka, and Sumdum quadrangles shows a gravity field that is characteristic of much of southeastern Alaska. Within the mapped area, the gravity changes from high Bouguer anomalies measured on the continental shelf, to low anomalies in the high mountains along the Alaska-Canada boundary. The change is not continuous but consists of two zones of steep gradients that border a belt or shelf of relatively flat gravity field. These contrasting areas coincide with the four principal tectono-stratigraphic terranes inferred in this part of Alaska by Berg and others (1978). Within the flat field and elsewhere on the map, a few local anomalies correlate closely with intrusions and geologic structures.

GRAVITY DATA

Most of the gravity data in the mapped area was obtained by skiff traverses during the summers of 1968 and 1969. The initial results were reported as simple Bouguer anomalies by Barnes (1972a, b, c, d,) and Barnes and others (1972a, b). A few earlier measurements had been made by Thiel and others (1958), and later a few skiff traverses in 1975 completed the shoreline coverage (Barnes and others, 1975). The map includes additional and previously unpublished data obtained from helicopter flights during the fall of 1981. Away from the shoreline, the present gravity coverage is only of reconnaissance nature where station spacings are typically 5 to 10 km, and large areas have even less coverage in the high mountains near the international boundary. Dense vegetation and poor weather limited the opportunities to collect additional data.

The earlier gravity data (1972) were based on the Potsdam gravity datum and the 1930 international gravity ellipsoid, but calculations for the Bouguer gravity map of Alaska (Barnes, 1977) showed new anomalies based on the international gravity standardization net (I.G.S.N. 71) (Morelli and others, 1974) and the 1967 geodetic reference system (International Association of Geodesy, 1971), which were also used for compiling the present map. The datum change decreases the observed gravities by about 14.50 mGal, and the combined datum and ellipsoid changes decrease the Bouguer anomalies by about 6.8 to 7.0 mGals in this part of Alaska.

Additional data for the Petersburg quadrangle may be placed on the same datum by reoccupation of any of more than two dozen gravity base stations that were described by Barnes (1972c). In addition, two previously undescribed stations in the area are located at the following similar locations outside new air terminals:

(1) Station PETE–Petersburg airport, new terminal, at the front of concrete steps from the waiting room to a parking lot and at the northeast corner of the bottom concrete slab, where the gravity is 981,632.06 mGals on the IGSN 71 datum.

(2) Station WRNF–Wrangell airport, at the front of the concrete steps leading from the waiting room to the parking lot and at the northeast corner of the bottom concrete slab, where the gravity is 981,800.95 mGals on the IGSN 71 datum.

Elevation control for most of the shoreline data was based on sea level corrected to mean-tide level using data from the Pacific Coast tide tables (National Oceanic and Atmospheric Administration, 1968,1975). Such elevations have an estimated accuracy better than 1 m. Altimetry was used for most of the remaining elevation control, although a few stations were placed at vertical angle bench marks. The accuracy of the altimetry is estimated to be within about 5-10 m, and the bench marks have a precision similar to the sea level control. Baseline gravity measurements were also made at many tidal bench marks so that potential gravity changes associated with the regional uplift of southeastern Alaska (Hicks and Shofnos, 1965) may be measured and analyzed at some later date.

The Bouguer gravity data on this map have been corrected for terrain to a radius of 99 km by using the computer program of Plouff (1977) and terrain data obtained from digital elevation model (DEM format) magnetic tapes (Barnes, 1983b; Elassal and Caruso, 1983). This digital elevation model shows all marine areas as having zero elevation, so the bathymetric part of the terrain correction has been neglected as have the effects of glaciers and lakes, but the resulting errors are believed to be less than one milligal. Elevations in Canada were obtained either from the digital elevation model or from average elevations estimated from Canadian topographic maps (scale, 1:250,000).

BOUGUER GRAVITY MAP OF THE PETERSBURG QUADRANG

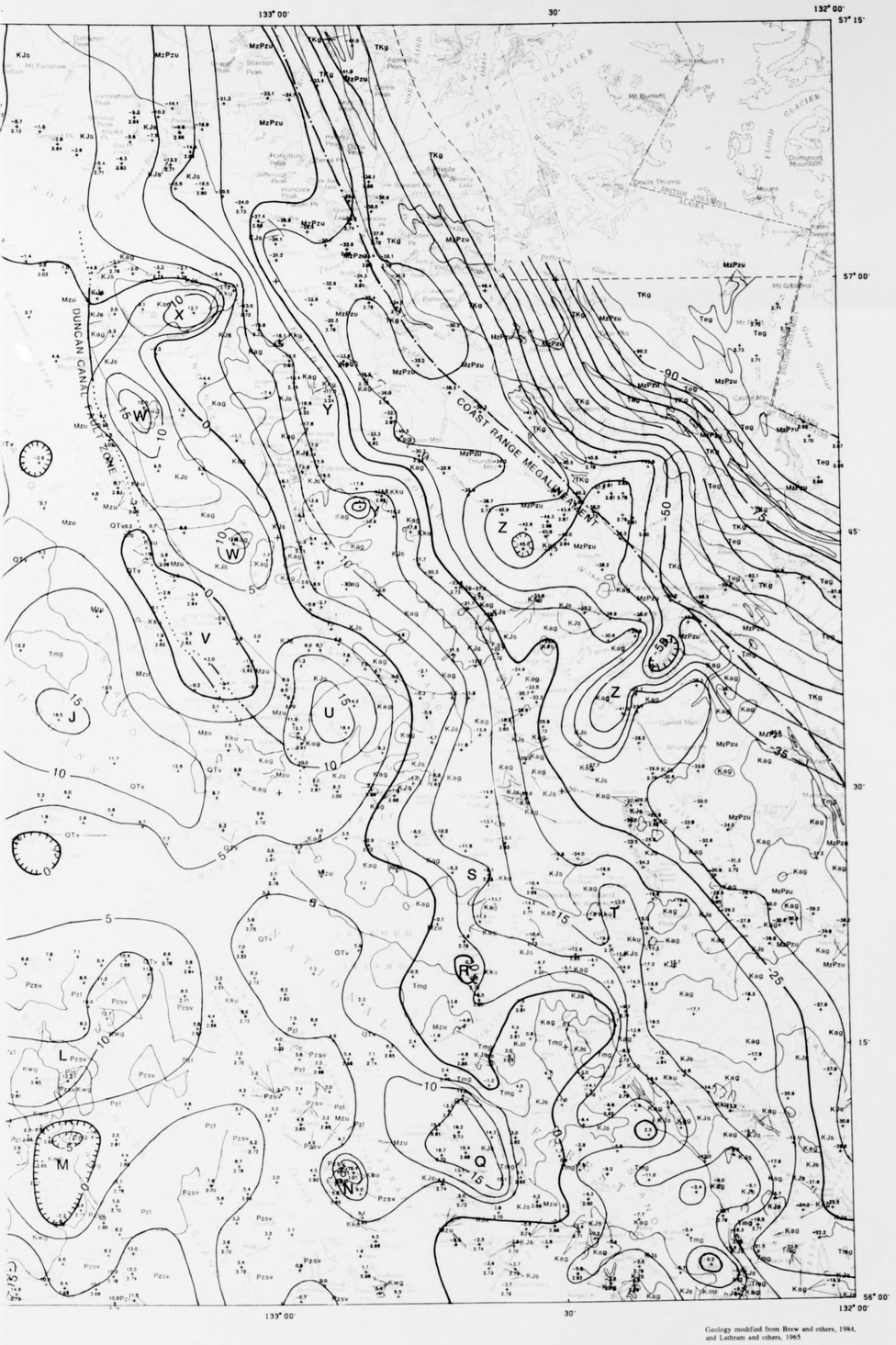
AND SUMDUM QUADRAN

By

David F. Barnes, David A. Brew, a

1989

best copy available


133° 00'
30'
132° 00'
57° 15'
57° 00'
45'
30'
15'
56° 00'
DUNCAN CANAL
KETCHIKAN
COAST RANGE MEGALINEAMENT
Mt. Burnett
Mt. Stanton
Mt. Dunsmuir
Mt. Gilbert
Mt. Crittenden
Mt. Davis
Mt. Thumb
Mt. Kendrick
Mt. Fanshaw
Mt. Hamilton
Mt. Jefferson
Mt. Harcourt
Mt. Bell
Mt. Wadsworth
Mt. Bradley
Mt. Bowen
Mt. Bruce
Mt. Wilson
Mt. Wood
Mt. Hunter
Mt. Hobart
Mt. Hall
Mt. Hoffman
Mt. Hilton
Mt. Hoyt
Mt. Hoffman
Mt. Hoffman
Mt. Hoffman

MAP MF-1970-A

DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

BOUGUER GRAVITY MAP OF THE PETERSBURG QUADRANGLE AND PARTS OF THE PORT ALEXANDER, SITKA, AND SUMDUM QUADRANGLES, ALASKA

By David F. Barnes, David A. Brew, and Robert L. Morin

MISCELLANEOUS FIELD STUDIES MAP
Published by the U.S. Geological Survey, 1989

BARNES AND OTHERS--BOUGUER GRAVITY, PETERSBURG AND PARTS OF PORT ALEXANDER, SITKA, AND SUMDUM QUADS., ALASKA

1:250,000 MAP MF-1970-A

best copy available